Journal of Cardiology Cases (2011) 3, e26–e28

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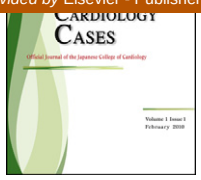

Case Report

Anomalous origins of the right and posterior descending coronary arteries from the left anterior descending coronary artery: Unusual pattern of single coronary artery

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Received 12 April 2010; received in revised form 15 June 2010; accepted 26 July 2010

KEYWORDS
Angiography;
Coronary vessels;
Myocardial infarction;
Stent

Summary We present an unusual pattern of single coronary artery which has not been reported previously. The proximal portion of the left anterior descending (LAD) artery gives rise to right coronary artery (RCA) and the distal LAD extends to the posterior descending artery which reaches the cardiac crux. A stent was implanted successfully at the middle portion of the LAD just beyond the origin of the RCA.

Case report

A 67-year-old man was transferred because of persistent chest pain lasting for 2 h. He had taken antihypertensive agents and been smoking 20 cigarettes per day for 30 years. He had no history of diabetes mellitus, dyslipidemia, or familial cardiovascular disease. At the emergency department, blood pressure was 90/60 mm Hg with 72 beats/min of heart rate. The electrocardiogram demonstrated ST-segment elevation myocardial infarction involving leads V_{1-4}, II, III, and aVF. Total creatine kinase (CK) and MB fraction of CK were 840 U/L (normal range, 21–232 U/L) and 40 U/L (normal range, 0–6 U/L). Troponin I was 46 ng/ml (normal range, less than 0.5 ng/ml). He was stabilized with hydration and dobutamine infusion, as well as administration of aspirin and unfractionated heparin.

Coronary angiography was performed through the right radial arterial access. The left coronary injection showed that the left circumflex (LCX) artery had minimal wall irregularities and gave obtuse marginal branches and the left anterior descending (LAD) artery had a diffuse, critical stenosis in the middle portion and thrombolysis in myocardial infarction grade 3 distal flow (Fig. 1). The distal LAD did not terminate near the apex and gave rise to the posterior descending artery (PDA), which extended near the cardiac crux, and the proximal LAD gave rise to small right coronary artery (RCA) (Figs. 2 and 3). No other right coronary origin

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doi:10.1016/j.jccase.2010.07.003

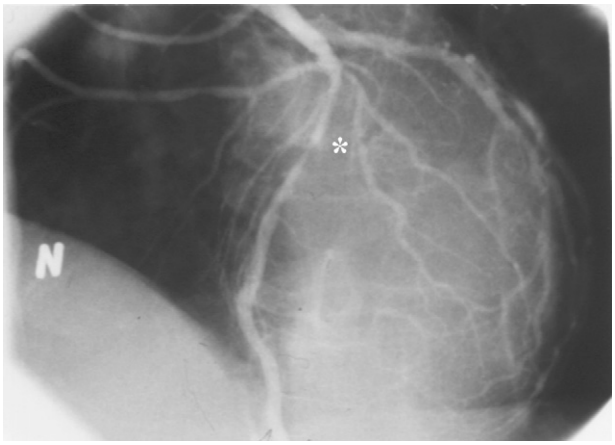

Figure 1 The left anterior descending artery had a diffuse, critical stenosis (asterisk) in the middle portion and good distal flow.

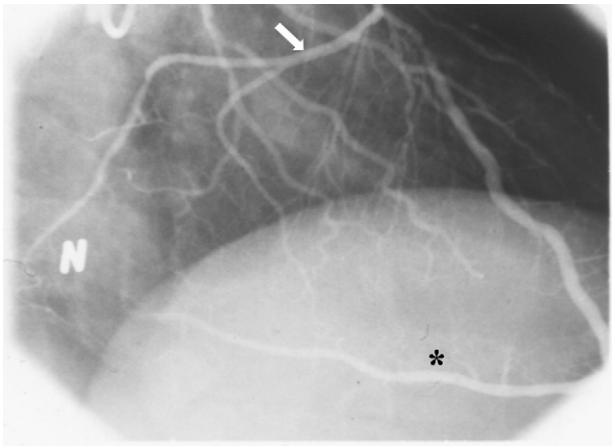

Figure 2 The proximal left anterior descending artery (LAD) gave rise to the right coronary artery (arrow) and the distal LAD extended into the posterior descending artery (asterisk), which reached the cardiac crux.

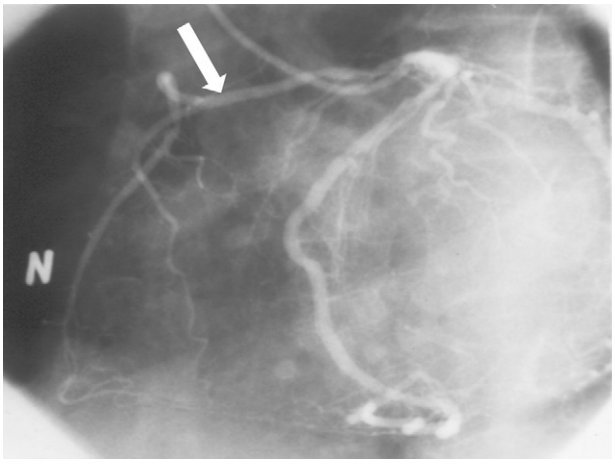

Figure 3 The right coronary artery (arrow) originated from the left anterior descending coronary artery.

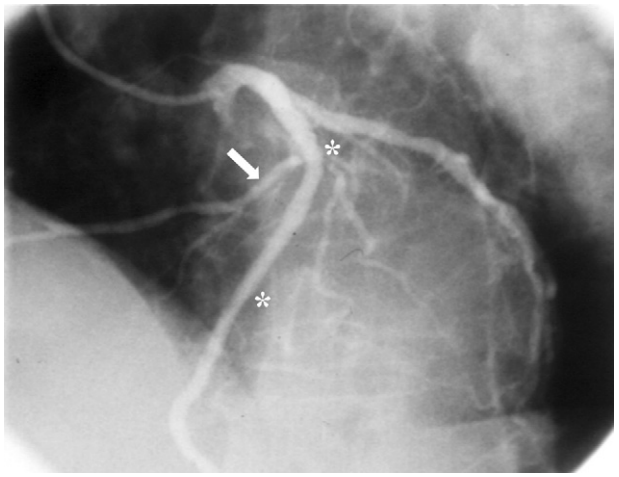

Figure 4 A long NIR® stent (3.5 mm in diameter and 32 mm in length) was implanted successfully at the stenosis of the left anterior descending coronary artery (between the asterisks) beyond the origin of the right coronary artery (arrow).

was found on aortogram. A long stent (NIR® stent Boston Scientific, Natick Massachusetts, USA, 3.5 mm in diameter and 32 mm in length) was implanted at the stenosis of the LAD successfully (Fig. 4).

Discussion

There is considerable variation in the blood supply to the inferior and posterior portion of the left ventricular wall, which is reflected by the concept of coronary dominance. The PDA arises from the RCA in a pattern of right dominance (85% of patients) and co-dominance (7% of patients), and from the LCX in a pattern of left dominance (8% of patients) [1]. Coronary artery anomalies are a group of disorders with various severities. In the largest study of coronary artery anomaly by Yamanaka and Hobbs, most anomalies are discovered as incidental findings during coronary angiographic study or autopsy, with an incidence of 0.64—1.3% [2]. Separate origins from the sinus of Valsalva are the most common anomaly, occurring in approximately 0.41% of patients studied.

As far as the anomalous origin of the RCA is concerned, many reports have described the origin of the RCA from the left sinus of Valsalva or from the pulmonary artery. There have been a few reports of the occurrence of a single left coronary artery with the RCA arising as a branch of the left main tract or the LCX. After the first report by Ogden in 1970, cases of the RCA arising as a branch of the LAD have been reported rarely [3,4].

Several types of anomalous origin of the PDA have been reported rarely. Levin and Baltaxe [5] observed four abnormal patterns including a double PDA, early origin of the PDA before the crux, supply of the diaphragmatic septum by a right ventricular branch, and supply of this region by an acute marginal artery. Other reported variations include anomalous origin of the PDA from the first septal perforator, from an obtuse marginal branch, and from a vascular ring formed between the RCA and LCX. The PDA also arises as a continuation of the LAD and is terminated before the crux [6,7] or extends beyond the crux, supplying branches to

the atrioventricular node and both atrioventricular grooves [8].

This case is a rare single left coronary artery with the RCA arising from the LAD, as in the case of Simkoff et al. [4]. But the RCA is small and rudimentary and the PDA arises as a continuation of the LAD and terminates near the crux. To our knowledge, the combination of these two rare anomalies is not even mentioned in a recent extensive review of the anomalies of coronary arterial origin [2] and has not been previously reported.

In patients with single coronary artery, although there is no clear evidence indicating the relationship between atherosclerosis and coronary arteries with abnormal origin and course, atherosclerotic narrowing of single coronary artery may be fatal. Fortunately, there was no severe stenosis or occlusion in the LCX and a long stent was implanted successfully at the stenosis located in the middle of the LAD, which extended into PDA near the crux.

In conclusion, the present report describes an extremely rare pattern of single coronary artery, which is the combination of the RCA originated from the middle portion of LAD and the PDA extended from the distal LAD. A stent was implanted successfully at the extremely long LAD.

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